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National Semiconductor

Jameco Part Number 171803

DM54LS491/74LS491 10-Bit Counter

General Description

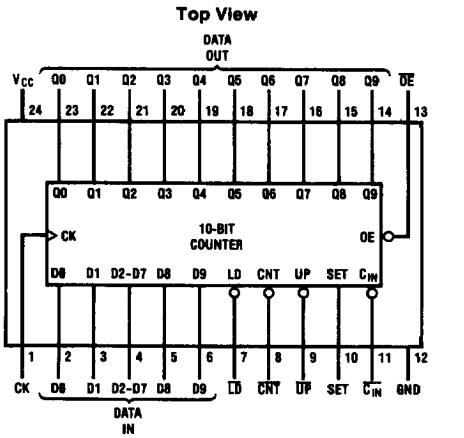
The ten-bit counter can count up, count down, set, and load 2 LSB's, 2 MSB's and 6 middle bits high or low as a group. All operations are synchronous with the clock. SET overrides LOAD, COUNT and HOLD. LOAD overrides COUNT. COUNT is conditional on C_{IN}, otherwise it holds.

All outputs are enabled when $\overline{OE}$ is low, otherwise HIGH-Z. The 24 mA I_{OL} outputs are suitable for driving RAM/PROM address lines in video graphics systems.

Features/Benefits

- CRT vertical and horizontal timing generation
- Bus-structured pinout
- 24-pin SKINNYDIP saves space
- TRI-STATE® outputs drive bus lines
- Low current PNP inputs reduce loading

Connection Diagram


Top View
DATA OUT
VCC Q0 Q1 Q2 Q3 Q4 Q5 Q6 Q7 Q8 Q9 OE
24 23 22 21 20 19 18 17 16 15 14 13
Q0 Q1 Q2 Q3 Q4 Q5 Q6 Q7 Q8 Q9
CK
10-BIT COUNTER
OE
D0 D1 D2-D7 D8 D9 LD CNT UP SET CIN
1 2 3 4 5 6 7 8 9 10 11 12
CK D0 D1 D2-D7 D8 D9 LD CNT UP SET CIN GND
DATA IN

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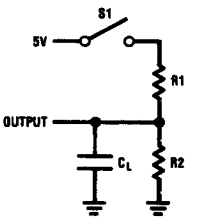
Order Number DM54LS491J, DM74LS491J or DM74LS491N
See NS Package Number J24F or N24C

Standard Test Load



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Function Table

$\overline{OE}$	CK	SET	LD	$\overline{CNT}$	C_{IN}	$\overline{UP}$	D9-D0	Q9-Q0	Operation
H	X	X	X	X	X	X	X	Z	Hi-Z
L	↑	H	X	X	X	X	X	H	Set all HIGH
L	↑	L	L	X	X	X	D	D	LOAD D
L	↑	L	H	H	X	X	X	Q	HOLD
L	↑	L	H	L	H	X	X	Q	HOLD
L	↑	L	H	L	L	L	X	Q plus 1	Count UP
L	↑	L	H	L	L	H	X	Q minus 1	Count DN

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Absolute Maximum Ratings

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/Distributors for availability and specifications.

Supply Voltage V_{CC}	7V
Input Voltage	5.5V
Off-State Output Voltage	5.5V
Storage Temperature	−65° to +150°C

Operating Conditions

Symbol	Parameter		Military			Commercial			Units
			Min	Typ	Max	Min	Typ	Max	
V_{CC}	Supply Voltage		4.5	5	5.5	4.75	5	5.25	V
T_A	Operating Free-Air Temperature		−55		125*	0		75	°C
t_w	Width of Clock	High	40			40			ns
		Low	35			35			
t_{SU}	Set-Up Time		60			50			ns
t_h	Hold Time		0	−15		0	−15		

* Case temperature

Electrical Characteristics Over Operating Conditions

Symbol	Parameter	Test Conditions			Min	Typ†	Max	Units
V_{IL}	Low-Level Input Voltage						0.8	V
V_{IH}	High-Level Input Voltage				2			V
V_{IC}	Input Clamp Voltage	V_{CC} = MIN	I_I = −18 mA				−1.5	V
I_{IL}	Low-Level Input Current	V_{CC} = MAX	V_I = 0.4V				−0.25	mA
I_{IH}	High-Level Input Current	V_{CC} = MAX	V_I = 2.4V				25	μA
I_I	Maximum Input Current	V_{CC} = MAX	V_I = 5.5V				1	mA
V_{OL}	Low-Level Output Voltage	V_{CC} = MIN, V_{IL} = 0.8V, V_{IH} = 2V	MIL	I_{OL} = 12 mA			0.5	V
			COM	I_{OL} = 24 mA				
V_{OH}	High-Level Output Voltage	V_{CC} = MIN, V_{IL} = 0.8V, V_{IH} = 2V	MIL	I_{OH} = −2 mA	2.4			V
			COM	I_{OH} = 3.2 mA				
I_{OZL}	Off-State Output Current	V_{CC} = MAX, V_{IL} = 0.8V, V_{IH} = 2V		V_O = 0.4V			−100	μA
I_{OZH}				V_O = 2.4V			100	μA
I_{OS}	Output Short-Circuit Current*	V_{CC} = 5.0V		V_O = 0V	−30		−130	mA
I_{CC}	Supply Current	V_{CC} = MAX				120	180	mA

* No more than one output should be shorted at a time and duration of the short-circuit should not exceed one second.

† All typical values are at V_{CC} = 5V, T_A = 25°C

Switching Characteristics Over Operating Conditions

Symbol	Parameter	Test Conditions (See Test Load)	Military			Commercial			Units
			Min	Typ	Max	Min	Typ	Max	
f_{MAX}	Maximum Clock Frequency	C_L = 50 pF, R_1 = 200Ω, R_2 = 390Ω	10.5			12.5			MHz
t_{PD}	Clock to Q			20	35		20	30	ns
t_{PZX}	Output Enable Delay			35	55		35	45	ns
t_{PXZ}	Output Disable Delay			35	55		35	45	ns

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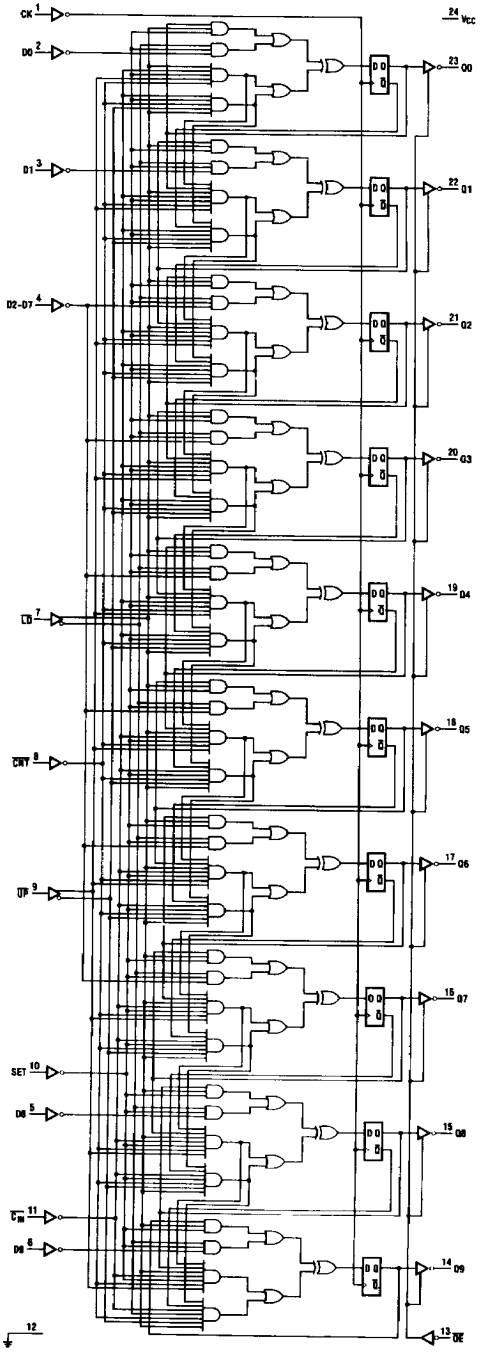
Logic Diagram

10-Bit Up/Down Counter



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